CLAIMS

1. Apparatus for electrosurgically cutting about a tissue volume, comprising:

a support member having an outer surface surmounting an interior channel and extending along an instrument axis to a forward region;

a tissue capture component positioned within said interior channel, having a leaf assembly comprising a plurality of elongate thin leafs extending forwardly from a base portion, a said leaf having a thickness extending between oppositely disposed faces, having a leaf width extending between oppositely disposed side edges and extending along a centrally disposed leaf axis to a tip region having a forward edge, having a cable guide channel extending along said leaf to a guide outlet at said tip region, and having an eyelet structure extending forwardly from the location of said edge with an eyelet width effective to withstand tissue cutting loads, having a surface substantially perpendicular to a said leaf face and having a cable receiving aperture extending therethrough said leaf assembly being moveable to deploy outwardly from said support member forward region, said capture component having a pursing cable assembly extending through said cable guide channel, said guide outlet, and said cable receiving aperture, electrosurgically energizable and deployable with each said leaf tip region to define an electrosurgical cutting arc of initially expanding extent and subsequent pursively contracting extent;

a drive assembly engageable with said leaf assembly base portion and said pursing cable assembly and actuable to move said leaf assembly to deploy outwardly from said support member while effecting said deployment of said pursing cable assembly; and

a control assembly drivably engageable with said drive assembly to effect said actuation thereof and having a terminal electrically coupled with said cable assembly to effect the electrosurgical energization thereof.

2. The apparatus of claim 1 in which:

said leaf eyelet structure is formed integrally with said tip region and is twisted thereupon to define said surface substantially perpendicular to said leaf face.

3. The apparatus of claim 2 in which said defined surface substantially perpendicular to said leaf face is substantially parallel with said leaf axis.

4. The apparatus of claim 2 in which:

said leaf eyelet structure is configured having oppositely disposed eyelet edges spaced apart to define a substantially constant said eyelet width, an aligned said eyelet edge being configured prior to said twisting as an extension of a coextensive said leaf side edge.

5. The apparatus of claim 4 in which:

said eyelet edge opposite said aligned eyelet edge is substantially parallel with a said leaf face.

6. The apparatus of claim 4 in which:

said leaf tip region forward edge is slanted inwardly toward said base portion from a location of adjacency with said eyelet edge opposite said aligned eyelet edge; and

said leaf eyelet structure is twisted in combination with a portion of said tip region to define said surface substantially perpendicular to said leaf face.

7. The apparatus of claim 1 in which:

said leaf eyelet structure is configured having oppositely disposed eyelet edges spaced apart to define a substantially constant said eyelet width, an aligned said eyelet edge being configured as an extension of a coextensive said leaf side edge.

8. The apparatus of claim 7 in which:

said leaf eyelet structure is formed integrally with said tip region, and is bent outwardly to define said surface substantially perpendicular to said leaf face along a bend line extending inwardly toward said base portion at an acute angle with respect to said leaf axis to said coextensive leaf edge.

9. The apparatus of claim 8 in which:

said acute angle is in a range of from about 22° to about 28°.

10. The apparatus of claim 8 in which:

said bend line extends from said tip region forward edge at a location adjacent said leaf eyelet structure eyelet edge opposite said aligned opposite edge to said coextensive leaf edge.

11. The apparatus of claim 10 in which:

said acute angle is about 28°.

12. The apparatus of claim 11 in which:

said eyelet edges are substantially parallel; and

said eyelet edges extend outwardly from a said leaf face at an angle of about 28°.

13. The apparatus of claim 8 in which:

said cable guide channel extends along said leaf to locate said guide outlet substantially at said leaf axis centrally between said oppositely disposed leaf side edges; and

said acute angle locates said eyelet structure cable receiving aperture forwardly of said guide outlet and in adjacency with said leaf axis.

14. The apparatus of claim 8 in which:

said bend line extends from a position on a said eyelet edge opposite said aligned eyelet edge and located inwardly from said cable receiving aperture to said coextensive leaf edge.

15. The apparatus of claim 14 in which:

said acute angle is about 22°.

16. The apparatus of claim 14 in which:

said eyelet edges are substantially parallel; and

said eyelet edges extend outwardly from a said leaf face at an angle of about 22°.

17. The apparatus of claim 1 in which:

said leaf eyelet structure is formed integrally with said tip region; and

said leaf eyelet structure is configured having oppositely disposed eyelet edges spaced apart to define said eyelet width, an interior said eyelet edge extending from said tip region forward edge at an acute angle with respect to and diagonally toward said leaf axis, said leaf eyelet structure being bent outwardly to define said surface substantially perpendicular to said leaf face along a bend line aligned with said interior eyelet edge and extending within said tip region to a said leaf side edge.

18. The apparatus of claim 17 in which:

said acute angle is about 35°.

19. The apparatus of claim 17 in which:

said cable guide channel extends along said leaf to locate said guide outlet substantially at said leaf axis; and

said acute angle locates said eyelet structure cable receiving aperture forwardly of said guide outlet and about said leaf axis.

20. The apparatus of claim 17 in which:

said oppositely disposed eyelet edges are spaced apart to define a substantially constant said eyelet width.

21. The apparatus of claim 19 in which:

said leaf tip region forward edge is slanted inwardly toward said base portion from a location of adjacency with said interior eyelet edge.

22. The apparatus of claim 1 in which:

said leaf eyelet structure is formed integrally with said tip region; and

said leaf eyelet structure is configured having oppositely disposed eyelet edges spaced apart to define said eyelet width, an interiorly disposed aligned said eyelet edge being configured as an extension of a coextensive said leaf side edge, said leaf eyelet structure being bent outwardly to define said surface substantially perpendicular to said leaf face along a bend line aligned with said interiorly disposed aligned said eyelet edge.

23. The apparatus of claim 22 in which:

said interiorly disposed aligned said eyelet edge is substantially coplanar with a said leaf face..

24. The apparatus of claim 22 in which:

said leaf tip region forward edge is slanted inwardly toward said base portion from a location of adjacency with said interiorly disposed aligned eyelet edge.

25. The apparatus of claim 1 in which:

said pursing cable assembly is configured with a multiple-strand, electrically conductive cable having a tensile strength of at least about 90,000 p.s.i. at the temperature of an electrosurgical cutting arc.

26. The apparatus of claim 1 in which:

said pursing cable assembly is configured with a multi-strand type 316 stainless steel cable.

27. The apparatus of claim 26 in which:

said multi-strand stainless steel cable has a diameter of about 0.005 inch to about 0.008 inch.

28. The apparatus of claim 1 in which:

said pursing cable assembly is configured as a multi-strand cable formed of a material selected from the group comprising: type 316 stainless steel, nickel-based alloys, martensitic stainless steels, and tungsten and tungsten-based alloys.

29. The apparatus of claim 28 in which:

said multi-strand stainless steel cable has a diameter of about 0.005 inch to about 0.008 inch.

30. Apparatus for electrosurgically cutting about a tissue volume, comprising:

a support member having an outer surface surmounting an interior channel and extending along an instrument axis to a forward region;

a capture component positioned within said support member forward region, having a forward portion extending to a forwardly disposed pursing cable assembly configured with at least one electrically conductive multi-strand cable energizable to provide an electrosurgical cutting arc leading edge portion, said cable exhibiting a strength supporting a load in tension greater than about one pound, in the temperature environment of said cutting arc, said cable extending into said interior channel, said leading edge of said forward portion being extendible from said support member forward region toward an outer peripheral orientation having a diametric extent and subsequently being drawn in contraction toward said instrument axis by stress asserted upon said cable assembly reaching a load value of about one pound upon a cable;

a drive assembly extending from drive engagement with said capture component to a driven engagement portion drivably moveable to effect extension of said leading edge and to apply said stress to said cable assembly; and

an actuator and control assembly drivably engageable with said drive assembly driven engagement portion to effect said movement thereof and to convey electrosurgical cutting energy to said cable assembly.

31. The apparatus of claim 30 in which:

said multi-strand cable exhibits an overall diameter within a range from about 6 mils to about 7 mils.

32. The apparatus of claim 30 in which:

said multi-strand cable is formed of a type 316 stainless steel.

33. The apparatus of claim 32 in which:

said cable comprises 19 strands each having a diameter of about 1.0 mils to about 1.6 mils.

34. The apparatus of claim 33 in which:

each said strand is formed of stainless steel with the formulation; 0.08% maximum carbon, 2.00% maximum manganese, 0.045% maximum potassium, 0.030% maximum sulfur, 1.00% maximum silicon, 16.00% to 18.00% chromium, 10.00% to 14% nickel, and 2.00% to 3.00% molybdenum.

35. The apparatus of claim 34 in which:

each said strand is formed with stainless steel with the formulation: 0.03% maximum carbon, 2.00% maximum manganese, 0.045% maximum potassium, 0.030% maximum sulfur, 1.00% maximum silicon, 16.00% to 18.00% chromium, 10.00% to 14% nickel, and 2.00% to 3.00% molybdenum.

36. The apparatus of claim 33 in which:

each said strand is formed of a nickel-based alloy with the formulation: 0.08 to 0.12 weight percent carbon, 1.0, weight percent manganese, 1.0 weight percent silicon, 4.0 to 7.0 weight present tungsten, 3.0 to 5.25 weight percent molybdenum, 15 to 18 weight percent chromium, 2.5 weight percent cobalt, 0.2 to 0.4 weight percent vanadium, 0.04 weight percent phosphorous, 0.03 weight percent sulfur, balance, nickel.

37. The apparatus of claim 33 in which:

each said strand is formed of a nickel-based alloy, with the formulation: 18.0 to 20.0 weight percent chromium, 10.0 to 12.0 (max) weight percent cobalt, 9.0 to 10.5 weight percent carbon, 0.5 weight percent silicon, 0.1 weight percent manganese, 3.0 to 3.3 weight percent titanium, 1.4 to 1.6 weight percent aluminum, balance, nickel.

38. The apparatus of claim 33 in which:

each said strand is formed of a nickel-based alloy with the formulation: 0.08 weight percent carbon, 0.35 weight percent manganese 50 to 55 weight percent nickel, 17 to 21 weight percent chromium, 4.75 to 5.5 weight percent cobalt and tantalum, 2.8 to 3.3 weight percent molybdenum, 1.0 weight percent cobalt, 0.65 to 1.5 weight percent titanium, 0.2 to 0.8 weight percent aluminum, 0.35 weight percent silicon, 0.3 weight percent copper, 0.015 weight percent phosphorous, 0.006 weight percent boron, balance, iron.

39. The apparatus of claim 33 in which:

each said strand is formed of martensitic stainless steel with the formulation: 0.15 (max) weight percent carbon, 11.5 to 13.5 weight percent chromium, 1.25 to 2.5 weight percent nickel, 1.00 (max) weight percent manganese, 1.0 (max) weight percent silicon, 0.040 (max) weight percent phosphorous, 0.030 (max) sulfur.

40. The apparatus of claim 33 in which:

each said strand is formed of martensitic stainless steel with the formulation: 0.20 (max) weight percent carbon, 15 to 17 weight percent chromium, 1.25 to 2.50 weight percent nickel, 1.00 (max) weight percent manganese, 0.040 (max) weight percent phosphorous, 0.030 (max) weight percent sulfur, 1.00 (max) weight percent silicon, balance, iron.

41. The apparatus of claim 33 in which:

each said strand is formed of tungsten alloyed with about 26 weight percent aluminum.

42. Apparatus for electrosurgically cutting about a tissue volume, comprising:

a support member extending to a forward region positionable in adjacency with said tissue volume;

a cutting component at said forward region having a multi-strand cable formed of a type 316 stainless steel with a lead portion of said cable being responsive to applied electrosurgical cutting energy to support an electrosurgical

cutting arc while moving in cutting relationship along a cutting locus through tissue, said cable exhibiting a tensile load at a region of said locus; and

an actuator assembly coupled with said cable and applying said electrosurgical energy and tensile load thereto.

43. The apparatus of claim 42 in which:

said multi-strand cable exhibits a diameter within a range from about 6 mils to about 8mils.

44. The apparatus of claim 42 in which:

said cable comprises 19 strands each having a diameter of about 1.4 mils.

45. The apparatus of claim 43 in which:

said multi-strand cable is configured to support a said load which is greater than one pound at a temperature of the environment of said electrosurgical cutting arc.